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ABSTRACT

This information brief explains principles of universal design as an approach to providing access for students with disabilities to the general education curriculum. The premise of universal design is that environments and products should be designed for maximum usability including flexible curriculum and learning environments to allow students with widely varying abilities to achieve established academic content standards. A table offers classroom examples of seven universal design principles. These include: (1) equitable use; (2) flexibility in use; (3) simple and intuitive; (4) perceptible information; (5) tolerance for error; (6) low physical effort; and (7) size and space for approach and use. Three overlying principles for adapting instruction to individual student needs are: first, multiple means of presentation of information; second, multiple means of expression by students; and third, multiple means of engagement for students. (Contains 17 references.) (DB)

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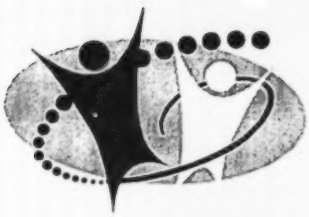

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By Christine D. Bremer, Ann T. Clapper, Chuck Hitchcock, Tracey Hall, and Mera Kachgal

Introduction

The Individuals with Disabilities Education Act (IDEA) Amendments of 1997 require that students with disabilities have access to, and participate and progress in, the general education curriculum. These provisions represent a significant enhancement to the federal requirement of physical access to classrooms in schools. The focus is now expanded to include educational access to the general education *curriculum*. This has posed significant challenges to general and special educators in terms of designing curricula that accommodate students' diverse learning needs and styles.

The Challenge

While the Individuals with Disabilities Education Act Amendments of 1997 promise curricular access for students with disabilities, school curricula are still largely designed for students without disabilities. While a number of techniques are available to teachers to help them adapt curricula to individual students, these post hoc modified solutions are time consuming and vary widely in effectiveness. These approaches stem from the outdated view that the fundamental problem resides in students with diverse needs, rather than in the design of curricula (King-Sears, 1997).

Hitchcock, Meyer, Rose, and Jackson (2002) note that most classroom curriculum materials rely almost exclusively on printed text. As a result, full participation and progress in the curriculum is possible only for those students who can access textbooks and other text materials in the form in which they are produced. While some schools and teachers provide adaptations and use assistive technologies to help individual students use printed text materials, "these adaptations can significantly change or water down the concepts and skills of the curriculum, offering in effect access to a different, diminished curriculum" (p. 12). Hitchcock et al. also note that some assistive devices, such as page turners, are too cumbersome to be readily moved from one classroom to another during the school day. Therefore, they should not be relied on to facilitate access to textbooks.

The premise underlying Universal Design is that environments and products should be designed, from the start, for maximum usability. From the standpoint of curricular access, Universal Design seeks to offer flexible curriculum and learning environments that allow students with widely varying abilities the opportunity to access the general curriculum and achieve the academic content standards that have been established for all students in the school, district, or state.

The Universal Design Approach

The concept of Universal Design originated in the field of architecture as a response to concerns about the inefficiency of individualized retrofitted solutions in buildings, and the inappropriateness of placing the burden of adaptation on individuals. Architect Ron Mace coined the term Universal Design in the early 1980s, and defined the concept as "the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design" (Center for Universal Design, 1997, para. 1). Mace, a wheelchair user, had personal experience with the failings of traditional design and was a pioneering advocate of aesthetically pleasing and usable design to meet the needs of people, regardless of their age or ability (Center for Universal Design, 1998).

Architects practicing Universal Design create structures that are intended from the outset to be used by all individuals, including those with disabilities. "The intent of Universal Design is to simplify life for everyone by making products, communications, and the built environment more usable by as many people as possible at little or no extra cost" (Center for Universal Design, 1997, para. 2). Universally accessible features such as ramped entrances and automatic doors are now routinely included in new construction intended for public use, such as government buildings, shopping malls, and schools.

In addition to physical structures, the concept of Universal Design has been extended to other products and to the field of communications. For example, when television captioning was first made available, it was only available to those who purchased expensive decoder boxes. Later, decoder chips were built into all televisions, making captions universally available. The captioning feature has proved to be of benefit to many users who do not have hearing impairments, including patrons of noisy restaurants, exercisers in health clubs, individuals seeking to improve their English language skills, and couples going to sleep at different times (Rose & Meyer, 2002).

Applying Universal Design to Learning Environments

The principles of Universal Design developed for architecture (Connell et al., 1997) are being applied to learning environments to improve access (Rose & Meyer, 2000). **Table 1** illustrates classroom examples for each of the seven principles of Universal Design.

Some of the principles of Universal Design developed in the field of architecture do not translate directly into all educational settings. For example, physical effort is a goal of physical education classes, but should not be a requirement in a history class.

Applying Universal Design to Curricula and Text Materials

Orkwis and McLane (1998) describe the potential of Universal Design to help all students meet high standards:

> In terms of learning, Universal Design means the design of instructional materials and activities that allows the learning goals to be achievable by individuals with wide differences in their abilities to see, hear, speak, move, read, write, understand English, attend, organize, engage, and remember. Universal Design for Learning is achieved by means of flexible curricular materials and activities that provide alternatives for students with disparities in abilities and backgrounds (Orkwis & McLane, 1998, What is Universal Design section, para. 3).

Simmons and Kame'enui (1996) developed a model to apply Universal Design to curricula. The features they identified include:

1. *Big ideas.* Curricula emphasize major concepts, principles, categories, rules, techniques, and hierarchical structures related to critical ideas and themes.
2. *Conspicuous strategies.* Curricula include explicit instruction on steps to complete required tasks.
3. *Mediated scaffolding.* Curricula include questioning, feedback, and prompts.
4. *Strategic integration.* Big ideas are explicitly linked within and across curricula.
5. *Judicious review.* Previously taught content is reviewed and linked to applications.
6. *Primed background knowledge.* New content is linked to and builds on students' background knowledge.

In the mid 1990s the Center for Applied Special Technology (CAST) began to apply the concept of Universal Design to curriculum materials and methods, describing their work as Universal Design for Learning (UDL). This framework reflects the view that a singular option to access curricular materials (usually text) and methods may produce barriers to diverse learners just as the single entrance mode of a staircase presents a physical barrier for some. UDL shifts the burden for reducing obstacles in curricula away from special educators and the students themselves and promotes the development of flexible curricula that can support all learners more effectively and make learning more accessible.

Mere access to information is neither sufficient nor synonymous with learning. Accordingly, the UDL framework consists of three overarching operative principles, each intended to minimize barriers and

Table 1: Classroom Examples of Universal Design Principles

Principles of Universal Design (Connell et al., 1997)		Classroom Examples
1. Equitable Use	"The design is useful and marketable to people with diverse abilities."	Students of all ability levels are appropriately challenged. Students with disabilities are neither segregated nor stigmatized, and privacy is respected.
2. Flexibility in Use	"The design accommodates a wide range of individual preferences and abilities."	Different learning styles are accommodated. Students can demonstrate knowledge through multiple means. Equipment allows left- or right-handed usage.
3. Simple and Intuitive	"Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level."	Textbooks are available digitally and provide hot links to definitions of difficult words (click on the word and see a definition). Lab equipment has clearly labeled controls, with symbols as well as words.
4. Perceptible Information	"The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities."	Students with sensory impairments can access materials in alternative formats. Texts are available in different formats and media; videos include captioning.
5. Tolerance for error	"The design minimizes hazards and the adverse consequences of accidental or unintended actions."	Students review each others' work and make changes prior to grading. Computer programs offer hints to help students with difficult problems. Lab equipment is designed to minimize breakage.
6. Low physical effort	"The design can be used efficiently and comfortably and with a minimum of fatigue."	Microscopes are connected to computer display screens. Lab equipment is physically easy to operate.
7. Size and space for approach and use	"Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user' s body size, posture, or mobility."	Classroom space is arranged to accommodate assistive devices and personal assistance. All students have a clear line of sight to the teacher and material being displayed.

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maximize learning through flexibility. Each of the principles advocates a particular teaching approach to support learner differences in recognition, strategy, or affect (Rose & Meyer, 2002). These principles propose adapting instruction to individual student needs through:

1. Multiple means of presentation of information to students (e.g., audio, video, text, speech, Braille, still photos, or images).
2. Multiple means of expression by students (e.g., writing, speaking, drawing, video-recording).
3. Multiple means of engagement for students (e.g. to meet differing needs for predictability, novelty, or group interaction).

The unifying theme of these three principles is the recommendation to provide students with a range of options while learning. Teachers begin the instructional decision-making process with goals. They must then select a range of materials and methods to most effectively and efficiently teach those goals.

One of the critical elements of instruction is assessment. Assessment of learners should inform instruction. Instruction and assessment must, therefore, provide students with adequate and equitable means to express knowledge and understanding (Dolan & Hall, 2001). Access to supports provided during instruction must also be provided during assessment to adequately analyze student performance. Although UDL seeks to improve curricular access for all students, Hitchcock (2001) cautions, "there is no such thing as a completely universally designed curriculum" (p. 23). Assistive technology and other adaptations will still be needed. However, technological advances will enable continual improvement in curricular access, and will reduce the need for adaptations.

Orkwis and McLane (1998) suggest using the following five strategies to implement Universal Design in the classroom. Orkwis and McLane note that the first four of these are consistent with accessible design guidelines from the Telecommunications Act of 1996, while the fifth step extends the concept of accessible design to include cognitive access. The strategies are:

1. Providing all text in digital format.
2. Providing captions for all audio.
3. Providing educationally relevant descriptions for images and graphical layouts.
4. Providing captions and educationally relevant descriptions for video.
5. Providing cognitive supports for content and activities, including:
   - Summarizing big ideas;
   - Providing scaffolding (supports that are diminished or removed as students gain competence) for learning and generalization;
   - Building fluency through practice;
   - Providing assessments for background knowledge; and
   - Including explicit strategies to make clear the goals and methods of instruction.

(Orkwis & McLane, Suggested First Steps section, para. 4)

Conclusion

The concept of Universal Design promises to improve outcomes for all students, including those with disabilities. Some aspects of Universal Design can be implemented at the local level; others will require the cooperation and commitment of manufacturers, publishers, and others. By changing the focus from remediation of individual disabilities to expansion of the usability of classrooms and curricula, benefits will be realized by students, teachers, and schools.

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Resources

Center for Applied Special Technology (CAST, Inc.)
40 Harvard Mills Square, Suite 3
Wakefield, MA 01880-3233
Ph: 781-245-2212
Fax: 781-245-5212
TTY: 781-245-9320
E-mail: *cast@cast.org*
Web site: *http://www.cast.org*

The CAST Web site includes information on how technology can help broaden opportunities for all, including people with disabilities. Information about Universal Design for Learning is featured.

The Center for Universal Design
North Carolina State University
College of Design
Box 8613
Raleigh, NC. 27695-8613
Tel/TTY: 919-515-3082
Fax: 919-515-3023
InfoLine: 800-647-6777
E-mail: *cud@ncsu.edu*
Web site: *http://www.design.ncsu.edu:8120/cud/*

This organization was founded by Ron Mace, who led the Universal Design movement in architecture. The site includes information about the Principles of Universal Design, history of Universal Design in architecture, the Center for Universal Design Newsline, publications, and more.

National Center to Improve the Tools of Educators (NCITE)
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Ph: 541-364-3405
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Web site: *http://idea.uoregon.edu/~ncite/*

NCITE is affiliated with the College of Education at the University of Oregon. The organization addresses issues concerning technology, media, and materials for individuals with disabilities. This Web site includes NCITE publications and useful links.

Further Reading

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